The MakerGear Mosaic 3D Printer - Part IV: The Z-Axis

Written By: Sean Michael Ragan

TOOLS:

- Hex/ Allen wrench (1)
- Hex/ Allen wrench (1)
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- Hex/ Allen wrench (1)
- Phillips head screwdriver (1)
- Spanner (1)

PARTS:

- Y-axis motor mount (1)
- Hardened steel rod (2)
- Shaft collars (4)
- Stepper motor (1)
  with pre-mounted shaft collar
- Red rubber gasket (1)
- Bolt (4)
- Washer (4)
- Lead screw (1)
- Lead screw handle (1)
- Bolt (1)
- Nut (1)
  aka "nylock"
- Z-axis limit switch assembly (1)
  AKA "stop switch"

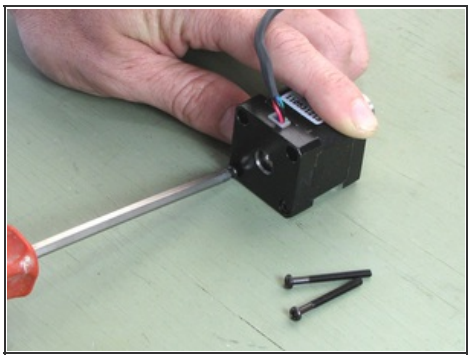
SUMMARY

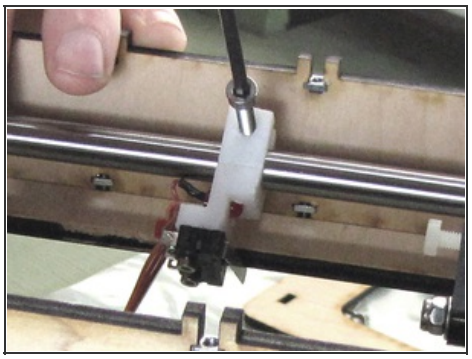
This is the fourth of eight guides in a series documenting my build of MakerGear's Mosaic desktop FDM/FFF 3D printer kit.

the frame,the Y-axis,the X-axis,**the Z-axis,**the extruder,the build platform, the electronics, andthe first print.

This part covers assembly of the Z-axis systems, including installation of the two hardened, precision ground steel shafts that guide the build platform along its vertical path of travel, the Teflon-coated lead screw that drives it, and the stepper motor that turns the lead screw. The Z-axis limit switch is also installed at this stage.

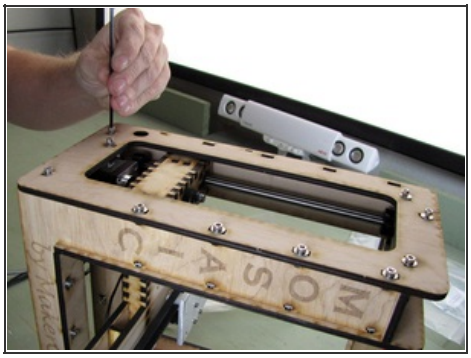
Step 1 — Prep work

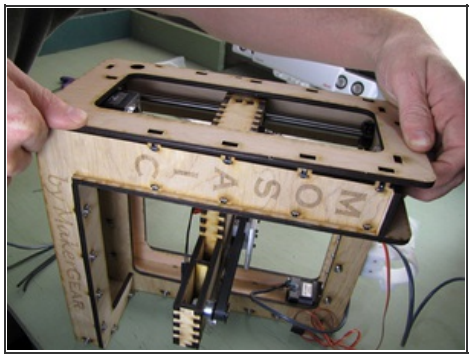


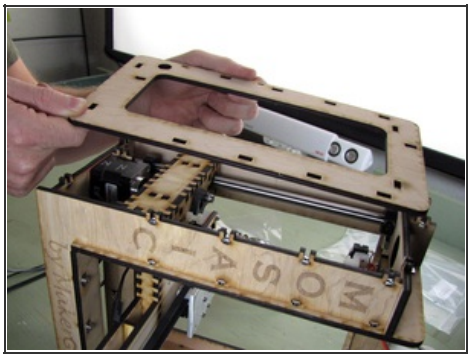


- Remove the four factory bolts from the stepper motor with a Phillips-head screwdriver. Don't worry, the motor will not come apart when you do this. You may want to save the factory bolts, just in case, but they are not needed in the finished printer.
- Press the white fused-filament handle over the geared end of the lead screw.
- Turn an M4x20mm socket cap bolt through the fused-filament clamp on the Z-axis stop switch assembly. Start an M4 nylock on the bolt shaft, but don't tighten anything down yet.
- I put the Z-axis stop switch assembly in place *before* starting the bolt and locking nut into the clamp, which made it much harder than it needed to be. Go ahead and put the bolt and nylock in place, now, and save yourself some trouble.

Step 2 — Remove plywood side panel

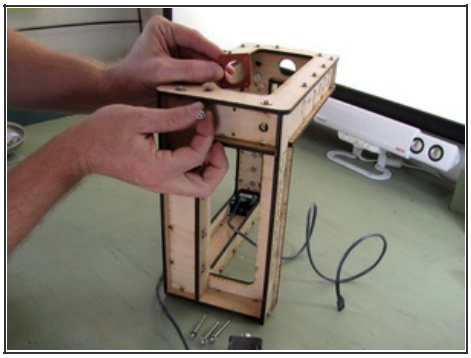


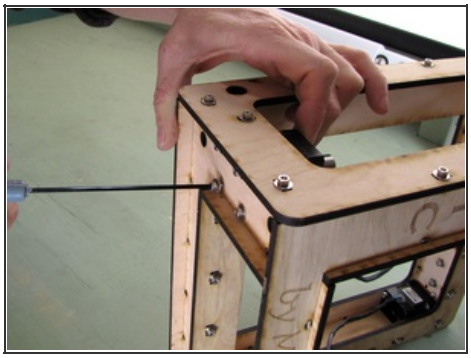




- Turn out the socket cap bolts holding plywood frame section I in place. Set them aside, with their washers.
- Lift off frame section I and set it aside. If you are careful, you can complete this part of the guide without removing the captive nuts, in the other frame sections, that hold section I in place.
- I thought I could perhaps complete this part of the guide without removing the side panel. I eventually found that it really can't be done, because one of the shaft collars can't be accessed for tightening with the panel in place. Save yourself some trouble, and remove the side panel now.

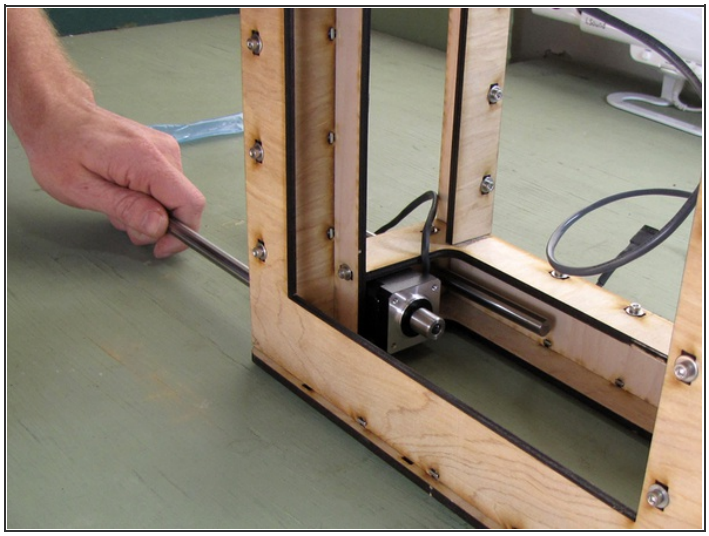
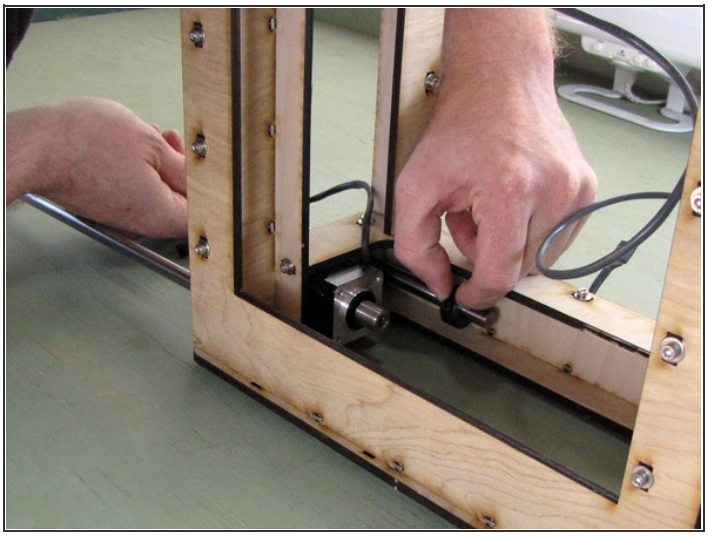
Step 3 — Mount stepper motor





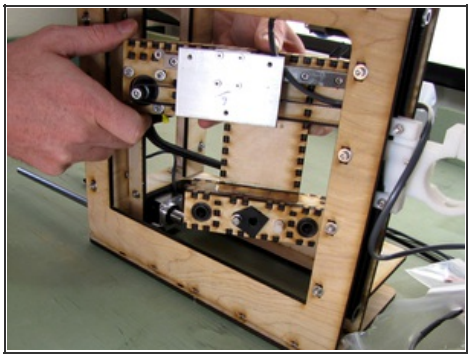
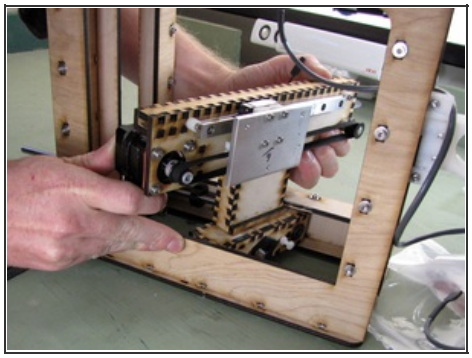
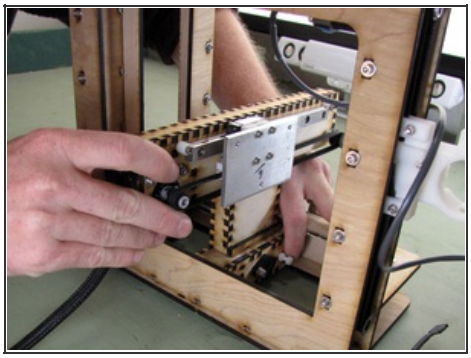
- Unlike the previous two stepper motors, the Z-axis motor mounting bolts are inserted from the motor's back face. The red rubber gasket, however, still goes between the motor and the wooden frame as before.
- Pass each of four M3x40mm socket cap bolts through an M3 fender washer, then through one of the four Z-axis motor mounting holes in frame section B, and then, finally, through one of the four corresponding holes in the red rubber gasket.
- Position the motor with the cable port facing the front of the printer, and align it with the four mounting bolts protruding from the gasket.
- Use a 2.5mm hex wrench to tighten the mounting bolts into the threaded holes in the motor. Be careful not to damage these threads, and, as always, do not overtighten.

Step 4 — Start steel rods into frame

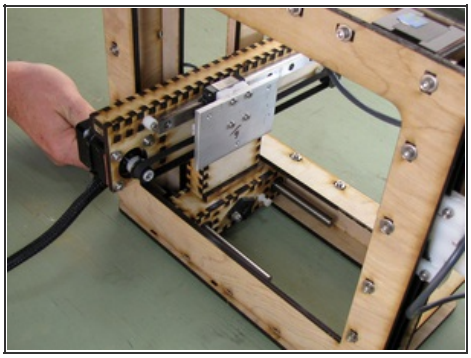
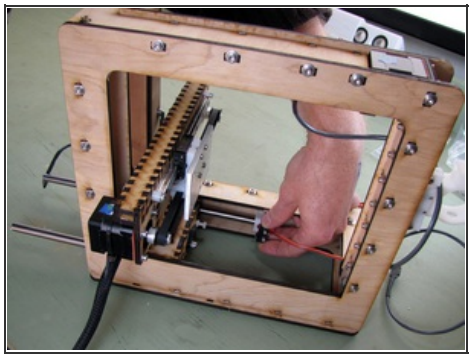
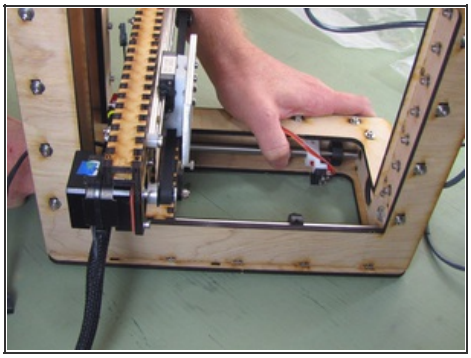
- Insert each of two 3/8" diameter round hardened steel rods into one of the holes in frame section B on either side of the motor. The fit is very close, because it has to be. Be patient and do not force anything.
- Once the steel rods are inside the frame, slip a shaft collar over the end of each. Do not tighten the collars yet.

Step 5 — Install Y-axis motor mount

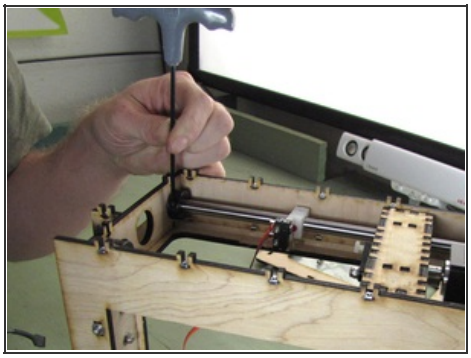
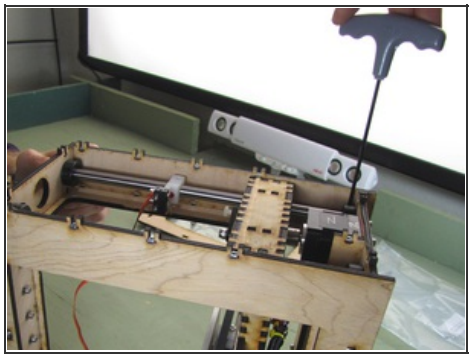
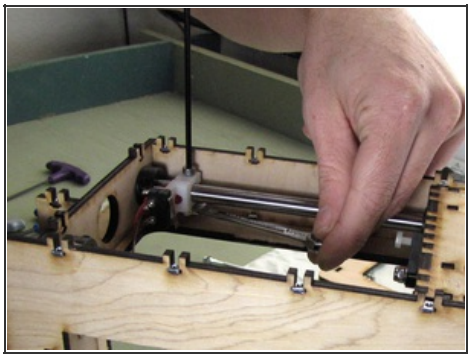
- Before pushing the steel rods in too far, lower the Y-axis motor mount assembly into the frame, as shown. You will have to turn it at an angle to get the small "ears" on the motor mount past the edges of frame section E.
- Once the "ears" have cleared the frame, rotate the Y-axis motor mount back the other way, until it is perpendicular to the steel rods.

Step 6 — Complete rod installation

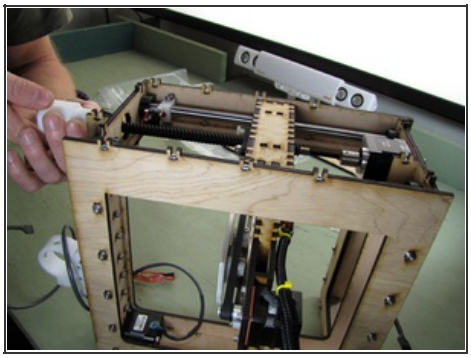
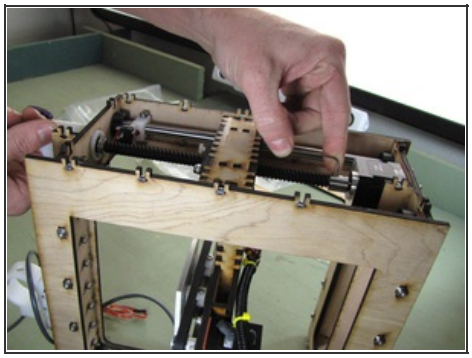
- Carefully guide the steel rods through the bearings in the Y-axis motor mount. Push them about three inches past the motor mount and stop.
- Slip the fused filament Z-axis stop switch clamp over the end of the rod closest to the front of the printer. Make sure the stop switch is oriented to face the nylon bolt protruding from the Y-axis motor mount.
- Slide another shaft collar onto each of the two steel rods.
- Guide the rods the rest of the way across the frame and through the support holes in part C.

Step 7 — Secure shaft hardware

- Make sure the steel rods are centered between frame sections B and C, with about 1/8" protruding on either end.
- On each rod, butt one of the two shaft collars up tight against the inside of the frame, and tighten it down with a 7/64" hex wrench.
- Once one collar on each rod is secure, butt the other collar, on each rod, tightly up against the opposite side of the frame. The idea is to minimize up-and-down play in the rods as much as possible. Tighten the collars down with a hex wrench, as above.
- Finally, slide the Z-azis stop switch assembly as far along the rod as it will go, as close to the upper shaft collar as possible. Make sure the switch itself is directly over the adjustable nylon stop on the motor mount. Then tighten the stop switch clamp using a 3mm hex wrench on the bolt and a 7mm spanner on the nylock.

Step 8 — Install lead screw


- Grasping the lead screw by the fused-filament handle, pass it through the large hole in the top of the frame.
- Carefully guide the end of the lead screw into the drive nut on the Y-axis motor mount, and turn it to engage the threads in the drive nut.
- Turn the lead screw through the drive nut until it protrudes from the underside of the motor mount by a couple of inches, then slide the screw and motor mount together along the rods until the brass tip of the lead screw engages the coupler on the Z-axis stepper motor.
- Secure the lead screw in the motor coupler by tightening the coupler's outer set screw with a 1/16" hex wrench.
- Replace panel section I, replace the 14 bolts and washers that secure it, and tighten them back down. As always, do not overtighten.

Next up: Mounting the extruder!

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